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Chinese Chess Site

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Andrew Krigline’s Honors Project in Art

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Chinese Chess Learning Website

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Honors Research Project

Submitted to

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Abstract

This project was an effort to demonstrate my technical abilities gained during my time at the University of Akron to design and develop a website dedicated to educating English speakers about Chinese Chess. The design was mocked up and prototyped with sketches and Photoshop. I used a multitude of web techniques when developing the website, including HTML5, CSS3, SASS, jQuery, and Bootstrap. My overall approach was to design a site that felt Asian by way of aesthetics and typography, but also to break the information down into digestible chunks.
For my honors project I took it upon myself to create a website to familiarize English speakers with the Chinese game of chess, xiang qi. This website was to be hand-made from scratch using no online services or pre-coded themes. All imagery, interactions, and layouts were to be made by myself, thereby sharpening and showing off the web related skills I have been building during my time at the University of Akron.

It is my goal to be a Web Designer and Front-end Developer upon graduation and thus it made sense for me to apply these skills to my senior honors project. Not only would I end up with a website to add to my portfolio, but I would also be spending my time researching and troubleshooting problems that I would encounter in the real world throughout the process. Furthermore, a website that is hosted and live is not only of benefit to me from a technical skill standpoint, but also has the potential to be used and enjoyed by any number of curious people for as long as the site functions.

This project relates to me not only because of my choice of career, but also because I spent ten years in China. During that time, I became reasonably familiar with the culture and people. It was also during this time that I was introduced to the game of Chinese Chess as an alternative to international chess. Since then I have preferred it over its more widely known counterpart.

There are a few websites in English dedicated to the game already. However, I desired to take a different spin on the site itself, focusing more on aesthetics and experience than a simple text-based instructional website. These differences make the site I have created more suitable as an introduction to the game than the other top sites out there at the moment. For example, the clean, uncluttered design of my site has a more friendly and open look than that of XiangQi in
English’s site. My site's segmented approach to familiarizing the user with the rules of the game is more akin to how a seasoned player would explain things step by step to a newcomer, as opposed to simply throwing a rule book at a new player and expecting them to figure things out.

Beyond being simply an excellent game to play and enjoy, Chinese chess has been around for thousands of years. It will always hold some significance in the hearts of the Chinese people, having been a favored pastime for so long. With China being a rising power in the world, the more of its culture people are exposed to, the better.

There seems to be a lot of debate over the origins of modern Chinese chess. With a history as long as China’s, memories have faded with regards to the game. The earliest known book on the theory of the game in its modern form is dated to the Song Dynasty (1127-1279 AD)\(^1\). Other sources put the game’s creation somewhere between 200 BC and 600 AD\(^2\). Some ancient texts even purport that the legendary emperors who supposedly reigned at the beginning of China’s history created the game\(^3\). One complication in the dating process is the existence of another game with a similar name that could have evolved into the modern Chinese chess.

The oldest existing reference to a game that resembles modern Chinese chess is a collection of supernatural tales that describes a person who experiences strange dreams of battle, only to discover that he had been sleeping over a tomb that contained a chess game. This was

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\(^{4}\) 2005. FACTS ON THE ORIGIN OF CHINESE CHESS (XIANGQI ... http://www.banaschak.net/schach/origins.htm.
supposed to have happened around 762 AD\textsuperscript{5}. Regardless of when it originated, it is clear to see that the game has evolved a fair amount over time.

Earlier descriptions of similar games assumed to be modern Chinese chess’ ancestors describe many more pieces than what is currently played with\textsuperscript{6}. There are also differences in the representation of the pieces, with a possible ancient version of the game being used to describe the movements of the stars, rather than troops in battle\textsuperscript{7}. It can be assumed that at some point the game was used as a military strategy exercise. It is also reasonably evident that the game was widespread and popular during the Song Dynasty\textsuperscript{8}.

The game itself is similar to its international counterpart in many ways. Both games are comprised of two sides engaged in a turn-based strategy game with the intention of capturing the enemy team's leader\textsuperscript{9}. Each team has the same number and makeup of pieces, resulting in a symmetrical game where the only advantages are who moves first and who has the better strategy. However, the differences between games lie in the specifics of the board, the number and location of the pieces, and the abilities of each piece.

The field of battle is still grid based, but rather than inhabiting a square, pieces sit on the intersection of the grid lines. This effectively makes the board "larger" in that it becomes a nine by ten grid, rather than the eight by eight of international chess. A river cuts through the middle of the Chinese chess board, marking each team's territory and modifying some units' movement

\textsuperscript{5} 2005. FACTS ON THE ORIGIN OF CHINESE CHESS (XIANGQI ... \texttt{http://www.banaschak.net/schach/origins.htm}.  
\textsuperscript{6} Banaschak, Peter. 1999. Early East Asian Chess Pieces: An overview.  
\textsuperscript{7} 2005. FACTS ON THE ORIGIN OF CHINESE CHESS (XIANGQI ... \texttt{http://www.banaschak.net/schach/origins.htm}.  
\textsuperscript{8} Banaschak, Peter. 1999. Early East Asian Chess Pieces: An overview.  
abilities. There is also a three by three grid in the middle of the board along each team's back wall that marks the palace, which limits each team's general and ministers' movement\textsuperscript{10}.

There are distinct similarities between some of international and Chinese chess' pieces. In both the leader of the army can move only one space at a time, and is the key to winning the game. Both games have a piece that moves horizontally or vertically as far as it can, until obstructed. In Chinese chess this piece is the chariot, in international chess it is the castle. Both games have a similar knight piece, with movement that ends two spaces forward and one space to the side of where the piece originated. There is a pawn piece in each game, which serves as the cannon fodder to support the specialty pieces\textsuperscript{11}.

The most noticeable difference in pieces is the absence of a queen piece in Chinese chess, and the introduction of a pair of cannon pieces. In international chess the queen is capable of travelling horizontally, vertically, and diagonally until obstructed. Diagonal movement in Chinese chess is relatively rare with only two pieces moving in that way, never more than two spaces at a time. However, Chinese chess makes up for the queen’s absence by providing a new pair of pieces that international chess has no equivalent to: the cannon\textsuperscript{12}.

The cannon is unique within Chinese chess because it attacks differently than it moves. They move similarly to the chariot, horizontally or vertically until obstructed, but they cannot attack a piece without a second piece to jump over. There must always be one piece between the target piece and the attacking cannon. The cannon then jumps over this single piece and destroys


the target piece. This mechanic works without any range limitations, as long as there is one piece, and only one piece, between the target and the attacking cannon, that cannon can destroy the target piece by occupying its space\textsuperscript{13}.

Beyond the lack of a queen and the introduction of the cannon, there are a few minor differences with regard to the mechanics of the pawns, and the ministers' and elephants' limitations relative to the bishops of international chess. Pawns move and attack forward only, until they cross the river. Once they have crossed, they are capable of moving side to side in addition to forward, but never backwards. The ministers are limited to single-space diagonal movement within the palace. The elephant piece can never cross the river, and moves exactly two spaces diagonally, as long as it is not obstructed\textsuperscript{14}.

Like international chess, it is a rule to notify the opponent when his general has been put in danger. It is also an invalid move to leave your general in danger or to put it into danger. The game ends either when one team is left without valid moves, or when some extra rule has been violated (for example chasing in club chess)\textsuperscript{15}.

Explaining the rules and mechanics of the game with words alone can aspire to teach people how to play the game, but a visual demonstration helps to truly drive the message home. This is why I decided to include a significant amount of animation in the site itself. This coupled with the layout and technology behind the structure of the site were all intended to enhance its message while complying with modern day and future web standards.

The website's skeleton is built on standard HTML5 (The latest standard of the internet's HyperText Markup Language)\textsuperscript{16}. The semantic nature of the tags usable in HTML5 make it easier to read and write by its very nature. The number of specific tags associated with specific tasks increased with HTML5 dramatically, and existing ones were re-defined to fit nicely alongside the old ones\textsuperscript{17}. Previously any major group of elements that required formatting was contained within a "div" (short for division), which is hardly a very helpful description of the purpose of that group. With HTML5, there are "section" and "article" tags that can better provide insight into the nature of the group's content and role in the page\textsuperscript{18}. This not only helps developers keep track of things in the code but also increased a computer's understanding of the page's format.

With HTML5 forming the skeleton of the website, CSS3 (the latest standard for Cascading Style Sheets) provide the skin and layout that is stretched on its surface. Without any inherent styling, a simple HTML site looks like a plain text document. Developers apply CSS as a method of styling the content within a website to make it consistent with the look and feel the designer lays out\textsuperscript{19}.

Everything from colors to column widths are set up with the use of classes and ids (two CSS selectors that identify an element for the purpose of styling that specific element) in an external stylesheet. That stylesheet is then linked to in the "head" portion of the HTML document, which the browser then uses to apply the correct styles to each element on the page.

\textsuperscript{16} Hickson, Ian, and David Hyatt. 2011. HTML5: A vocabulary and associated APIs for HTML and XHTML. W3C Working Draft, May 25.
\textsuperscript{17} Frain, Ben. 2012. Responsive web design with HTML5 and CSS3. Packt Publishing Ltd.
\textsuperscript{18} Hickson, Ian, and David Hyatt. 2011. HTML5: A vocabulary and associated APIs for HTML and XHTML. W3C Working Draft, May 25.
This method of applying styles is the current industry standard, and is far superior to the old method of applying each element's style inline within the HTML document\textsuperscript{20}. With an external stylesheet not only is it simpler to apply a uniform style to multiple elements, but that style is considerably easier to change after being set up.

Within CSS there are a number of frameworks that have been put together by communities and companies that intend to make designing and developing for the web easier and quicker. The community at large is divided over whether the benefits of these frameworks outweigh the drawbacks\textsuperscript{21}. The frameworks themselves are extremely useful in that they offer cross browser code ready for deployment. However, the danger is that many of such frameworks are bloated in their fullness, as they have pre-made code that the site may never call for\textsuperscript{22}. This in turn may drive load times up, which is the ultimate enemy of a website.

I decided that in order to familiarize myself with the way these frameworks work I would implement one into the project. I chose one of the most commonly used frameworks, Bootstrap, which was partly developed by the team behind Twitter\textsuperscript{23}. It's primary feature is a grid based class system that has built in breakpoints to allow any design built correctly to be mobile-friendly from the start. With the number of mobile users steadily on the rise, this is an extremely important feature for any website\textsuperscript{24}.

\textsuperscript{21} 2014. Responsive Design Frameworks: Just Because You Can ... http://www.smashingmagazine.com/2014/02/19/responsive-design-frameworks-just-because-you-can-should-you/.
\textsuperscript{22} 2014. Responsive Design Frameworks: Just Because You Can ... http://www.smashingmagazine.com/2014/02/19/responsive-design-frameworks-just-because-you-can-should-you/.
\textsuperscript{23} 2008. Bootstrap · The world’s most popular mobile-first and ... http://getbootstrap.com/.
\textsuperscript{24} Frain, Ben. 2012. Responsive web design with HTML5 and CSS3. Packt Publishing Ltd.
In addition to incorporating the Bootstrap CSS framework, I also decided I'd take this opportunity to familiarize myself with an alternative method to writing standard CSS that is currently making itself known in the world of web development. Syntactically Awesome Stylesheets (SASS) is a language extension for CSS that enables extended functionality beyond what is normally capable\textsuperscript{25}. The syntax is similar to stock CSS but makes complicated features simpler to implement. Its goal is to enable designers and developers to code smarter by taking time away from some of the more tedious CSS methods. The stylesheets created in SASS aren't viewable by any browser at this time, so it must be run through a processor that converts it into working CSS before deployment\textsuperscript{26}.

The latest specifications for CSS3 allow it some ability to animate and change things based on interaction with elements. However, in order to provide the full measure of intractability the project called for Javascript was needed. Javascript has been the method to dynamically edit web pages since their inception. Many advanced web development techniques are only possible through Javascript. It is the favored method to edit the contents of a webpage in real time on account of its stability and performance perks over platforms like Flash, that significantly slow loading times\textsuperscript{27}.

Javascript itself is a vast and extremely flexible programming language which, unfortunately, I am not skilled in working with. Within it there are several commonly used libraries that make it simpler to work with. The most common of these is jQuery, an open source library with a huge amount of support from its community\textsuperscript{28}. The syntax of jQuery is much easier

\textsuperscript{25}2009. Sass: Syntactically Awesome Style Sheets. \url{http://sass-lang.com/}.
\textsuperscript{26}2013. Sass: Sass Basics. \url{http://sass-lang.com/guide}.
\textsuperscript{28}2006. jQuery. \url{https://jquery.com/}.
to read and write than stock Javascript. It also makes many useful functions available to developers without them having to code the entire thing from scratch. All of the logic behind the site's mechanics are operated through jQuery.

Javascript, HTML, and CSS are three separate technologies that are core to the function and form of a website, but they have nothing to do with the content of the site itself. As has been spoken many times, "a picture is worth 1000 words." Imagery in websites can be broken down into many facets, from high-colored jpgs to compressed video mpegs. I decided early on that I would need to animate the majority of the site's content in order to effectively demonstrate it to the audience. There are methods of using Javascript and CSS to create imagery, but their benefits do not usually outweigh the cost of time it takes to make them.

As such I resorted to an image format that allowed me to create the animations beforehand and save each as a single file that could be accessed when needed. That file format is the GIF (Graphic Interchange Format), and it was created in the 1980s at the dawn of the graphic user interface. Gifs are one of very few image formats to allow animation, their primary drawback being that they limit the number of colors within an image to 256. This limitation is hardly noticeable on account of the simplistic nature of my demonstration images. Each individual animation on the site is a separate GIF file.

GIFs were only useful for the animations, I also resorted to one of the web's newer technologies to make the backgrounds of each separator appear rough and painted: the SVG (Scalable Vector Graphic). Although SVGs have existed for a long time, only recently have they started making their usefulness on the web known. These images are math based vector

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images, so they scale infinitely without loss of quality. In addition to their scalability, SVGs load very quickly on web pages, and can even be embedded into the page itself, to further decrease load times.

Having established what technology would drive the site's functionality, I turned my attention to the content and design of the site. I started by finding out what the current online resources for Chinese chess were and what they lacked. A short google search returns several sites that detail the rules and mechanics of the game. However, each of them appears as though they were created in the earlier 2000s. I determined this by noting several similarities between the appearance of the sites I found with sites from that era. The images used are pixelated, super-simple graphics, and the grid structure is rigid and non-responsive to browser window change. In addition, each of the top sites fail to create an atmosphere that feels asian in their attempts to teach an asian game.

I thus decided that not only would I break up the information into bite-sized chunks for my site, I would also draw inspiration from traditional Chinese art to create the look and feel of the site. Chinese paintings generally carry a distinct style and color palette, so I had it in my mind to pull such things from them into my site's design. This eventually manifested itself in both the colors used and the use of painted-image style separators between sections.

I greatly admired the stylistic direction of the website devoted to Guild Wars 2, and the user interface and loading screens in the game itself. These employ a very painted look that could easily be adapted into what I envisioned for the project. Very gestural and abstract brush strokes mask out content and imagery in the Guild Wars 2 loading screens. I pulled much of the style for the project from the styles of Guild Wars 2.
Since there wasn't a lot of information to impart on the audience (compared to some sites), I decided that a single long page would be sufficient. This also makes for a better user experience, in that the user doesn't need to click between pages and wait for the content to load more than once. In order to incorporate some navigation into the page, I also decided that a "sticky" navbar across the top (one that follows the user as they scroll) suited the site best.

Splitting the content up into meaningful sections was not terribly difficult, I approached the problem as though I was going to sit down one-on-one with someone and teach them in person. Starting with the basic information and explaining each piece in sequence from there, finally ending with how the game was won.

With source material and a vague sense of how things should be in my head, I set out to make some rough sketches of the idea, followed shortly by a detailed mockup of the site in Photoshop. This mockup then served to provide reference to the structure of the site as it was being built.

The process of creating the site began with the creation of an HTML structure that would effectively and efficiently deliver the content in a method that could be styled easily. This structure must be coherent to robots that crawl the web searching and indexing its contents. This also required that I resolve what manner of Javascript plugins I would be using for some of the functionality of the site's interactions. These plugins only work because a certain structural syntax is in place that they can latch on to and edit.

Once the structure of the HTML was in place, I set about styling the page with CSS, applying the form and layout styles starting with the most broad and ending with the most
specific instances of style. I kept the site as fluid as possible, avoiding fixed dimensions for any element, in order to make it easier to adapt into a mobile format (with bootstrap's help).

After the majority of the CSS was done, I turned my attention to the problem of the interactions. I wanted each segment of text to display an image when hovered over. To accomplish this, I effectively created my own jQuery plugin that looked for a number of identifiers in the HTML, and then displayed the image needed when the right element was hovered over. I encountered several problems with this method. Namely that each hover, however brief or unintentional was triggering a change. To combat this I adapted a technique that involved setting a delay before executing the function attached to the hover event. I also had to come up with some method of providing feedback to the user that something happened when they hovered over section of text. This was eventually accomplished by changing the style of the active text block to reflect that it was currently being displayed in animated form.

I was unable to make the site respond to a user interaction with anything other than the block of text itself. Ideally any time a user interacted with an item that had an accompanying text block, that text block would be displayed. This functionality sounds simple but in fact would require an entirely different method of structure that the time allotted to this class did not allow me to consider. Additionally, GIF images are not the ideal way to display animation, as each image must be loaded by the user in order to view them. There are methods of scripting animations between elements in the code that are more versatile and less heavy. Unfortunately the within the limitations of the three credit hours, I was unable to make these things work.
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http://www.w3.org/TR/SVG/.

Chinese Chess is a game of strategy, wit, and tactics.

Let your plans be dark and impenetrable as night, and when you move, fall like a thunderbolt.
— Sun Tzu, The Art of War

The Game

The classic version of Chinese Chess is the original of modern Chinese chess, with a history as long as history itself, having been played in China for over 2000 years. The game is played on a checkered board, divided into 8 rows and 8 columns of squares, 64 in total. There are 16 pieces in total, 8 for each player. Each piece has its own unique movement and capture rules, making the game both simple and complex.

The Pieces

There are 12 pieces on each side. Each piece is composed of two pieces: a red (馬) and a black (馬). Typically, the pieces are arranged on a checkered board in Chinese style for the red pieces. There are some differences in the setup and the move rules, but minor differences.

The Rules

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The Board

A checkered board has 64 squares, divided into 8 rows and 8 columns, making it the basis for the game. The board is divided into two parts: the red part and the black part. Each player has 16 pieces: 8 red pieces and 8 black pieces.

The River

A checkered board is divided into two parts: the red part and the black part. Each player has 16 pieces: 8 red pieces and 8 black pieces.

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Invincibility lies in the defence; the possibility of victory in the attack.
— Sun Tzu, The Art of War

The expert in battle moves the enemy, and is not moved by them.
— Sun Tzu, The Art of War

Pretend inferiority and encourage his arrogance.
— Sun Tzu, The Art of War

The General

The general is the poise on the checkered board, and the center is important. The general in the middle is the most important piece of the game. The general can move up to one space in any direction on the checkered board.

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The Board
Chinese Chess is played on a board with 9 rows, traditionally 19 rows, in international Chess, the pieces sit on the intersections of the 9 rows as opposed to the squares. This effectively makes the board more spacious than in international Chess.

The River
A row runs between the two sides, traditionally representing a river significant to the Chinese war in ancient China. The river exactly lines to check the two sides, but also affects the movement of two pieces.

The Palace
This top square is the only place that the general for each side can reside. Both the king and the royal must remain inside the palaces at all times.

The Starting Positions
The board sets up where the pawns and the pieces start with the circle, but these spots have no other significance in the game.

The Pieces
There are a total of 36 pieces per side. Each army is composed of five pieces, one general, and pawns of each rank. Traditionally the pieces are crossed with the Chinese character for the unit. There are some differences in the character used for each side, but the pieces are identical.

The Horse
Most common The horse moves one step along a line, then one step diagonally away from its starting position. They can be blocked. If a piece occupies a space adjacent to the horse's starting position, the two units cannot be used.

The Rules
Traditionally the red team goes first. The objective is to capture and destroy the enemy general. The game is played in sequence until the conditions for ending the game are fulfilled. Each player moves one piece per turn.

Attacking
Units move into the space they attack, not occupying it.

Winning
The game ends when one general is dead, or when it becomes impossible to kill either general.

Check
After moving your opponent’s general in danger, you must announce the fact by saying “Shang” (check’ in English).

Chasing
There are a variety of rules that aim to prevent perpetual chasing, though the definitive of “perpetual” differs from state to state. In general, the player making perpetual chasing can be ruled to have lost the game.

Checkmate
Checkmate is achieved when you knock over an opponent’s general. In general, checkmate is achieved when you knock over an opponent’s general using your piece. Checkmate is achieved when you knock over an opponent’s general, and the piece on which you checkmate is captured. Checkmate is achieved when you knock over an opponent’s general, and the piece on which you checkmate is captured. Checkmate is achieved when you knock over an opponent’s general, and the piece on which you checkmate is captured.